OLIVER SACKS: WHAT THE SCIENTIST TAUGHT US BY HUMANIZING NEUROLOGY

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ABSTRACT

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Acclaimed neurologist and author Oliver Sacks is a unique figure in both the science community and the literary world. His work stands on the border of empirical, scientific reporting and subjective, narrative accounts of his patients. While his works have drawn immense praise from intellectuals across disciplines, they have also been the subject of criticism. Academics in the science community have criticized his narrative style for being qualitative instead of quantitative and personal instead of observational, while academics in the humanities have accused him of exploiting his patients. This thesis examines Sacks's works and evaluates how he reconciled the sciences and the humanities through his writing. His publications and criticisms of them were used to assess his contributions to the humanities, to the sciences, and to general readers, and to determine his legacy.

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Introduction

On May 7, 1959, British novelist and research scientist C.P. Snow delivered the Rede Lecture at the Senate House in Cambridge, titling it "The Two Cultures and the Scientific Revolution" and describing the divide between literary intellectuals and natural scientists.[1] He argued that "the intellectual life of the whole of western society is increasingly being split into two polar groups," the two "cultures" of literary intellectuals and scientists, which act in opposition to each other and suffer "a gulf of mutual incomprehension."[2] The gulf, he held, mainly results from dangerous misinterpretations and misunderstandings between the two groups, such as non-scientists believing that scientists are "shallowly optimistic, unaware of man's condition" and scientists thinking that "literary intellectuals are totally lacking in foresight… anxious to restrict both art and thought to the existential moment."[3] The divide between the two cultures is disastrous not only because they cannot communicate with each other, but because it prevents intellectuals from applying science and technology to solve the problems of the world.[4]

In his lecture, Snow insists that the problematic divide can only be remedied by reforming the education system that puts so much emphasis on specialization and by blurring the borders between the arts and sciences. Although it is not the responsibility of every scientist and every literary intellectual to be fully versed in the discipline of the other, and although specialization serves many important functions in society, there should be a move to increase the degree of engagement between the two cultures. Snow was mainly focusing on the natural

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[1] C.P. Snow, *The Two Cultures*, Canto ed. (London: Cambridge University Press, 1993), vii.
[2] Ibid., 3–4.
[3] Ibid., 5.
[4] Ibid., viii.

sciences, such as chemistry and physics, but medicine, by nature, holds an intermediary place among the distinctions Snow made.

Oliver Sacks, a neurologist and best-selling author who wrote clinical tales about his patients, graduated from medical school at Oxford in 1958, a year before Snow's lecture.[5] He had a natural affinity for both the sciences and writing, and sought to explore both in his career, doing so until his death in 2015. It is possible that Snow's lecture encouraged him in his fledgling years of clinical practice; it is certain that Sacks shouldered some of the responsibility of remedying the schism between the two cultures. He brought compassion into his diagnoses, shedding light on the human condition and humanizing the patients he treated. Sacks was the ultimate observer and listener, but was also an active one. His works bridge the gap between the sciences and the humanities that C.P. Snow lamented.

This thesis examines how Sacks reconciled the sciences and the humanities through his writing, and discusses the implications of his works. The research question the thesis attempts to answer is: How significant were Sacks's contributions to the literary and scientific communities and to general readers, and what did he accomplish by writing in a narrative, clinical tale form? The thesis focuses on analyzing his more popular books, *Awakenings* and *The Man Who Mistook His Wife for a Hat,* with insight from his memoir *On the Move* and other works, such as journal articles he wrote and interviews he gave. One contribution the thesis makes is the synthesis of various materials that Sacks produced with the criticisms that exist of them. Specifically, the thesis assesses his use of "neurological narratives" and argues that this particular form serves as a complement to existing scientific literature. The thesis also brings in aspects of Sacks's personal life, and argues that many parts of his personal life were significant in determining how

[5] Alison Snyder, "Obituary: Oliver Sacks," *The Lancet* 386, no. 9999 (September 25, 2015): 1130, doi:10.1016/S0140-6736(15)00211-1.

he developed his practice. The thesis presents and addresses criticisms of Sacks's works, as well, such as criticisms that his works lacked "real science" once they gained popular appeal. There are three parts of the thesis, "Part 1: Literary Implications and Contributions," "Part 2: Scientific Implications and Contributions," and "Part 3: Influence on General Readers." The divisions between the parts mirror the divisions between forms of discourse, but in each part, it is apparent that Sacks's works were not so easily split into their scientific and humanistic components. Herein lies the crux of the thesis, because Sacks was able to seamlessly integrate both by means of his narrative approach. Although Sacks wrote for the field of neurology, the contributions he made apply to the entire medical field, and can be applied to other scientific disciplines as well. The thesis argues that Sacks's biography and personal experiences permeated his writing, and made for a more empathetic approach. The results of the thesis can be used to argue that medicine needs to continue moving in a similar direction.

Part 1: Literary Implications and Contributions

Background: Oliver Sacks and the Clinical Tale

Born on July 9, 1933, to physicians in London, Sacks felt a draw toward science early on.[6] His father was a general practitioner, and his mother was a professor of anatomy who was the first woman to join the Royal College of Physicians and Surgeons.[7] Two of his brothers were physicians, as well, and although he did not always know he wanted to become a physician, he notes in his memoir *On the Move* that he "was obsessed with both science and literature" when he was young and was easily able to take classes in both areas when he was in school.[8] However, when he went to Oxford for university as a pre-med student, he felt a social and physical divide between those working toward science degrees and the rest of the students at the university.[9] As he immersed himself in the principles of neurophysiology and the like, he began to realize that he was missing "general reading" aside from *Essays in Biography* by Maynard Keynes, and decided that he wanted to write his own biographical essays, but clinical ones "presenting individuals with unusual weaknesses or strengths and showing the influence of these special features on their lives; they would, in short, be clinical biographies or case histories of a sort."[10] A combination of other influences, including the works of neuropsychologist A.R. Luria, would prompt Sacks to do so as he encountered unique cases later in his career.

After earning his medical degree from Queen's College at Oxford University in 1958, Sacks went on to do his internships at Middlesex Hospital in London and Mount Zion Hospital in

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[6] Douwe Draaisma, "Oliver Sacks (1933-2015)," *Nature* 525, no. 7568 (September 10, 2015): 188, doi:10.1038/525188a.
[7] Judith Weinraub, "OLIVER SACKS HERO OF THE HOPELESS," *The Washington Post*, January 13, 1991, F1.
[8] Oliver Sacks, *On The Move: A Life* (New York: Vintage Books, 2016), 12–13.
[9] Ibid., 14.
[10] Ibid.

San Francisco, and completed his neurology and neuropathology residency at the University of California at Los Angeles.[11] In addition to being a practicing neurologist, he served as a Professor of Neurology at Albert Einstein College of Medicine and New York University and a Professor of Neurology and Psychiatry at Columbia University Medical Center.[12] As he encountered neurological cases that were particularly interesting and puzzling, he wrote about them in a narrative form, including elements of the classic case history and adding emphasis on the plights of individual patients.

In doing so, Sacks was building on the tradition of the case history, which harks back to the Ancient Greek Hippocratic medical books of *Epidemics,* which describe symptoms and treatment of various medical maladies.[13] These were the first case narratives in literature, and they served as a means by which to establish rules for diagnosis and treatment and as answers to questions about medical cases.[14] Thus, Hippocrates provided the first case histories, which were descriptions of the natural history of disease.[15] However, Sacks wished to go further. Neurological narratives were common in the nineteenth century, and one of Sacks's influences, Russian neuropsychologist A.R. Luria, wrote that "the power to describe, which was so common to the great nineteenth-century neurologists and psychiatrists, is almost gone now…it must be revived."[16] Luria did so in his works, and Sacks, a natural-born writer, did the same. He often wondered if he should be a writer, but decided that "while [he] might have a bit of talent, [he]

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[11] Snyder, "Obituary: Oliver Sacks," 1130.
[12] Ibid.
[13] Gianna Pomata, "The Medical Case Narrative: Distant Reading of an Epistemic Genre," *Literature and Medicine* 32, no. 1 (Spring 2014): 7.
[14] Ibid., 9.
[15] Oliver Sacks, *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, 1st Touchstone ed. (New York: Simon & Schuster, 1998), vii.
[16] qtd. in ibid., viii.

had nothing to write about. Medicine came to [his] rescue this way."[17] In an interview in *The Lancet,* Sacks says that writing and medicine combine to form case histories, which is a form of writing he loves, and although he values the technological advances in medicine, he feels strongly about keeping the tradition of case histories alive.[18]

In the preface of his book, *The Man Who Mistook His Wife for a Hat,* Sacks describes why he turned to more narrative clinical tales:

> [Case histories] tell us nothing about the individual and *his* history; they convey nothing of the person, and the experience of the person, as he faces, and struggles to survive, his disease. There is no 'subject' in a narrow case history; modern case histories allude to the subject in a cursory phrase ('a trisomic albino female of 21'), which could as well apply to a rat as a human being. To restore the human subject at the centre—the suffering, afflicted, fighting, human subject—we must deepen a case history to a narrative or tale; only then do we have a 'who' as well as a 'what,' a real person, a patient, in relation to disease…[19]

The result is his take on the neurological narrative. Many of his books feature collections of narrative case histories or clinical tales that describe patients' conditions and how the conditions affect their lives. Sacks himself describes his writings variably as neurological narratives, clinical tales, and case histories, among others.[20] Instead of the detached, often cold profiles of disease that case histories provide, Sacks's narratives are honest descriptions of how disease and disorder

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[17] Mary Christ, "Oliver Sack's Science Project: He Made His Reputation Studying Other People's Minds. Now He's Taking a Look at His Own," *Book* Nov.-Dec. 2001, no. 48+ (n.d.): 48.
[18] Niall Boyce, "Oliver Sacks: Seeing Things," *The Lancet* 380, no. 9854 (November 16, 2012): 1639, doi:10.1016/S0140-6736(12)61936-9.
[19] Sacks, *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, viii.
[20] Gregory Cowles, "Oliver Sacks, Neurologist Who Wrote About the Brain's Quirks, Dies at 82," *The New York Times*, August 31, 2015, B6.

manifest themselves in patients. His clinical tales and narratives give readers a glimpse into not only the physical reasons behind neurological conditions, but also the philosophical implications of them. Some of his works are stories about coping with disease, some are about finding small triumphs in the face of adversity, and some are acknowledgments of the tragedy his patients face. To many critics, he walks a fine line between adding meaningfully to scientific discourse and showcasing the grotesque misfortunes he encounters, and some critics assert that he stumbles into the realm of voyeurism more often than not.

In an article in *Literature and Medicine*, Sacks discusses his use of the clinical tale, "an elemental form which is indispensable for medical understanding, practice, and communication."[21] Clinical tales are key because they follow the pattern and form of patients presenting themselves to physicians, physicians listening sympathetically while keeping in mind other such cases and the physiological processes behind the behavior, and suggesting treatment once the case is presented. Just as in clinical settings, where physicians "creatively" correlate their knowledge of pathological processes with what the patient describes to them and "extract or abstract from it a (syndromic or etiological) 'case,'" clinical tales preserve the voice of the patient and use it to construct a narrative.[22]

Typical case histories, while they serve many functions and are essential to clinical discourse, often omit the accounts of the patients that can be crucial to understanding the process of disease. According to Sacks, they "are wholly descriptive, not narrative or dramatic…they do not show us the patient thrust into a role," and "it is only in a fully narrative form—a clinical tale—that the subject, his 'fate,' the drama of his existence, can be exhibited in all their fullness

[21] "Clinical Tales," *Literature and Medicine* 5 (1986): 16.
[22] Ibid., 17.

and force."[23] Exhibiting the drama of a patient's existence might seem counterintuitive for a physician whose aim is to serve others; "roles" and "drama" are associated with show business and profit, and Sacks has received no shortage of criticism for what people perceive as exploiting his patients. However, cases, or sickness, or any deviations from what patients consider "normal" are inherently dramatic and thus the reality of those situations can only be truly represented in a dramatic form. Sacks concluded the article with the hope that "the dangerous breach between science and humanism, which has undermined medicine (and medical writing) for many decades, may be healed" by a phenomenological approach, one of the many alternate forms of analysis that "can come closer than anything else to the living quality of experience." [24] Sacks was not alone in describing the need for a phenomenological approach in medicine, one that takes into account perception and consciousness from a first-person point of view. Phenomenology is a philosophy that centers on perception of phenomena and the experience of conscious perception.[25] Others have proposed using phenomenology to illuminate direct patient experiences and help describe experiences of illness, and have argued that phenomenology is of value in clinical medicine.[26]

In 2005, Douwe Draaisma, a professor of the history of psychology at the University of Groningen in the Netherlands, interviewed Sacks and later remained in contact with him, ultimately writing Sacks's obituary in *Nature.* He wrote that Sacks allowed his case histories to add to the theory that the brain is an organism "capable of plasticity and compensation" that should be understood holistically, and that Sacks thought of neurological disorders as challenges

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[23] Ibid., 20.
[24] Ibid., 23.
[25] Havi Carel, "Phenomenology and Its Application in Medicine," *Theoretical Medicine and Bioethics* 32, no. 1 (2011): 34, doi:10.1007/s11017-010-9161-x.
[26] Ibid., 33.

people face in finding normal equilibrium.[27] Sacks saw himself and other physicians as mediators whose role is to help patients mobilize their other skills and resources while adapting to their conditions.[28] However, Sacks's works provide more than stories about helping patients persevere through their struggles. They convey the realities of the difficulties his patients face, they make understanding neurological conditions more feasible for general audiences, and they remove some of the mysticism and stigma surrounding neural abnormalities. On the opposite end, they remind physicians that their profession is human in nature, and they bring scientists into a dialogue with the people their work affects.

Draaisma wrote that although Sacks did not invent the neurological narrative, he "was certainly its culmination."[29] Once while being interviewed and asked how he wished to be remembered in 100 years, Sacks said that he would like to be remembered as having "listened carefully to what patients and others [had] told him," and that he had tried to convey "what it was like for them."[30] He did so with an impeccable power of observation that gives readers, in both general and academic audiences, an understanding of the mechanisms of disease and a way to connect with the afflicted in society. He simultaneously de-pathologizes his patients and remains grounded in the painful realities of neurological conditions, allowing his patients' voices to be heard by readers in a way that would be lost by traditional medical writing. And while traditional clinical discourse offers much that more narrative forms of writing often lose, such as quantifiable change, complex physiological mechanisms, and the promise of complete objectivity, Sacks's clinical tales serve as complements to the existing medical literature

[27] Draaisma, "Oliver Sacks (1933-2015)," 188.
[28] Ibid.
[29] Ibid.
[30] Cowles, "Oliver Sacks, Neurologist Who Wrote About the Brain's Quirks, Dies at 82," B6.

precisely because readers can see how he struggles to remain an objective clinician while engaging his audience and taking a humanistic approach to medicine.

Works and Style

When working at Beth Abraham hospital in 1966, Sacks encountered a population of elderly patients who had contracted encephalitis lethargica in the 1920s and had been in various states of near-catatonic Parkinsonism, almost physically frozen in time, since then.[31] In 1969, he gave them an experimental drug, L-DOPA, which caused them to awaken, becoming mobile and present for the first time in decades.[32] Although L-DOPA did not prove to be a miracle drug and many of the patients later regressed to their pre-treatment state of Parkinsonism, the drug briefly gave them life and restored some of their humanity. Sacks realized that reporting the phenomenon in purely clinical terms would not adequately describe the reactions taking place.[33] Rather, "the language he needed to tell his patients' stories had been pushed into the shadows, displaced by the rise of 'clinimetrics' and diagnosis by machine."[34] Sacks turned to the works of A.R. Luria, a neuropsychologist who "combined the clinical precision of 20th-century neurology with both the humane observations of the great Victorian physicians and the explorations of the psyche that Freud undertook in his own case histories."[35] Luria had developed a type of writing that he called "romantic science" and that brought his clinical observations more in touch with the stories of his patients.[36]

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[31] Sacks, *On The Move: A Life*, 169.
[32] Ibid., 173.
[33] Ibid.
[34] Steve Silberman, "The Fully Immersive Mind of Oliver Sacks," *WIRED*, April 1, 2002, http://www.wired.com/2002/04/sacks-2/.
[35] Ibid.
[36] Ibid.

Sacks turned his observations at Beth Abraham into the 1973 book *Awakenings,* a series of case histories about the individual patients he had treated there. The book takes the form of "extended case-histories or biographies," as Sacks calls them, of 20 of his patients at "Mount Carmel," the name to which he changed Beth Abraham in order to protect the privacy of the hospital.[37] In addition to the case histories, Sacks gives reflections about the patients and how the treatment changed their lives, as well as his thoughts on what the field of medicine is missing. He notes in the preface that the book has a "metaphysical theme—the notion that it is insufficient to consider disease in purely mechanical or chemical terms; that it must be considered equally in biological or metaphysical terms" to address the increasingly mechanical emphasis of modern medicine, which, despite its advances, has led to "intellectual regression, and a lack of proper attention to the full needs and feelings of patients."[38]

The needs and feelings of patients are what Sacks pushes through in the book, at times giving more consideration to these than to the pathological mechanisms at work or the data one would expect from such a study. But he establishes that his goal was to answer metaphysical questions, meaning those implicated in health and disease such as "How are you?"--questions that are illegitimate to answer "with a list of 'data' or measurements regarding one's vital signs, blood chemistry, urinalysis, etc.."[39] Furthermore, Sacks says that "a thousand such data don't begin to answer the essential question; they are irrelevant and, additionally, very crude in comparison with the delicacy of one's senses and intuitions."[40] However, metaphysics is not to be confused with mysticism. In reading the 20 case biographies, most involving a great deal of tragedy, readers quickly realize that L-DOPA was not the miracle drug the world hoped for.

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[37] *Awakenings*, 1st ed. (Garden City, New York: Doubleday & Company, Inc., 1974), xiii.
[38] Ibid.
[39] Ibid., 189.
[40] Ibid.

Sacks divides each of the 20 chapters, titled after the patient under discussion, into sections discussing what the patient was like before L-DOPA, their course on the drug, and the months or years following initial treatment. In this way, the chapters offer personal insight into how the patients changed with the treatment, and how their lives were affected after they had been on the drug for extended periods of time. The chapters include descriptions of their remaining symptoms, their personal lives, reasons for continuing or discontinuing treatment, and their current state at the time he was writing the book, if they were not already deceased. Some patients were able to continue treatment with marked improvements in their symptoms. For example, some had fewer oculogyric crises—sustained, involuntary rolling of their eyes upward—or showed "loosening up" of previously stiff, immobile limbs.[41] However, some developed adverse symptoms such as paranoid responses and increased tremor and rigidity.[42] Because each patient had different symptoms, had a different duration of sickness, and had a different response to L-DOPA, the individual chapters dedicated to the patients were necessary to make the unpredictable nature of the treatment known and to make readers aware of the severity of the Parkinsonism they suffered.

Although Sacks saw many of the same symptoms in various patients, he was sensitive to subtle differences among them and conveyed them in his writing. His observations show readers the nuances of postencephalitic parkinsonism. Consider, for example, his descriptions of Hester Y., a patient who had been completely motionless for over twenty years:[43]

> Mrs. Y.'s life in Mount Carmel was eventless and placid. She was well-liked by other patients and nurses and staff, for her humour and character somehow

[41] "Oculogyric Crisis," *Merriam-Webster*, n.d., http://www.merriam-webster.com/medical/oculogyric%20crisis; Sacks, *Awakenings*, 167.
[42] Sacks, *Awakenings*, 63 and 170.
[43] Ibid., 81.

> "showed through" her dense immobility. She was virtually motionless and speechless at all times, and when I first met her, in 1966, I suddenly realized—with a profound sense of shock—that it was possible for Parkinsonism and catatonia to reach an *infinite* degree of severity. She certainly gave no impression of deadness or apathy (like Magda B.); no impression of veto or "block" (like Lucy K.); no impression of aloofness or withdrawal (like Leonard L. and Miron V.); but she did give the impression of an infinite remoteness. She seemed to dwell in some unimaginably strange, inaccessible ultimity, in some bottomlessly deep hole or abyss of being; she seemed crushed into an infinitely dense, inescapable state, or held motionless in the motionless "eye" of a vortex. This impression was accentuated by her slow rhythmic humming, and by her slowly-rotating palilalic responses.[44]

In the above section, Sacks differentiates between the "impressions" that his patients give. He emphasizes that Hester Y.'s catatonia is not one of "deadness," "block," "withdrawal," or any of the other presentations he describes even though all of them could be reduced to the more technical terms of akinesia, catatonia, or the like. Instead of generalizing the "impressions" as such, Sacks allows the nature of each patient to come through in his descriptions. This helps readers connect with each patient and gives readers a better understanding of the struggles the individuals face, as each description evokes a different emotional response and level of understanding with Sacks's audience. A characterization of apathy, for example brings to mind a different image of a patient than does one of "infinite remoteness," which invokes feelings of

[44] Ibid., 78–79.

sadness and desolation and conveys the reality of Hester Y.'s experience. Furthermore, he shows his attention to detail and the amount of thought he put into his patients.

In an article in *The New York Review of Books* titled "Neurology and the Soul," Sacks insisted that "it was not merely humanly, or ethically, necessary to see these patients as individuals; it was scientifically necessary to do so as well," which he concluded after realizing that "what seemed an impersonal or even depersonalizing disease had, in fact, a strong quality of the personal, and could not be understood without reference to the personal."[45] What he was referring to was the tendency of postencephalatic patients to display behavior reminiscent of their personal lives, such as one patient cited by a different physician who would, each time he was about to have an attack, move to catch an imaginary ball.[46] Upon further inquiry, his physicians discovered that the patient's first attack had occurred while he was moving to catch a ball in a game of cricket.[47] Through this examples and others, Sacks saw "how movements and scenes from a person's experience could be embedded in his physiology: how his physiology itself could evolve, could become 'personalized'."[48] By writing chapters about individual patients and by dedicating part of the chapters to descriptions of their personal lives before sickness, Sacks respects the fact that disease cannot always be accurately portrayed by a list of symptoms or criteria; personal experience influences how illness plays out and how individuals respond to it.

A chapter about another patient, Frances D., ends with a reflection on how she emerged from her course of treatment:

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[45] "Neurology and the Soul," *The New York Review of Books*, November 22, 1990, 45.
[46] Ibid.
[47] Ibid.
[48] Ibid.

> She is not one of our Star Patients, one of those who did fabulously well on L-DOPA, and stayed well. But she has survived the pressures of an almost life-long, character deforming disease; of a strong cerebral stimulant; and of confinement in a chronic hospital from which very few patients emerge alive. Deeply rooted in reality, she has triumphantly survived illness, intoxication, isolation, and institutionalization, and has remained what she always was—a totally human, a prime, human being.[49]

This paragraph follows pages detailing Frances D.'s months and years since she was first given L-DOPA, including descriptions of her dosages, parkinsonian symptoms, withdrawal symptoms, and behaviors. But in closing the chapter with the above conclusion, Sacks brings his readers back to connect with his patient and reminds them that despite the less-than-ideal results, she has "survived" a harrowing experience.[50] One may take his characterization of her as "a totally human, a prime, human being" as a testament to the resilience she demonstrated and the inability to describe her experiences from within the conventions of mechanical medicine, but in describing her as so, Sacks also raises a metaphysical question about what it means to be human, or how patients can remain human when their experiences are conveyed through literature.[51] He once again brings up her humanity, a reminder that at the center of medical achievement, the multitude of fascinating outcomes, and the intriguing relationships between biological processes and behavior, are people who suffer at the hand of advancement.

Sacks expands on this idea in his epilogue to *Awakenings,* written after spending seven years with his patients.[52] He writes that they were fated to explore the depths of human

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[49] Sacks, *Awakenings*, 50.
[50] Ibid.
[51] Ibid.
[52] Ibid., 235.

experience and suffering, subjected to "unsought crucifixions" that did, however, result in a "deeper understanding of the nature of affliction and care and cure."[53] The patients themselves understood their position of involuntary martyrdom. One wrote in an autobiography: "I am a living candle. I am consumed that you may learn. New things will be seen in the light of my suffering."[54] The poignancy of that statement is emblematic of the experiences of many of the patients, once-dormant candles who are reignited with the introduction of L-DOPA. Some emerge burning brightly, are invigorated by treatment, and can sustain wellness, while others are extinguished by the failure of the drug. All endure a suffering that can only be closely represented by the type of writing Sacks employs.

What Sacks said he primarily saw though his time at Beth Abraham was the "utter inadequacy of mechanical medicine," which fails to represent the "living imagination of Nature itself" that must be mirrored when picturing and writing about nature.[55] Indeed, as this thesis will examine in a later section, the fluidity of sickness and suffering is not sufficiently expressed in typical clinical discourse. Sacks concludes that "we are over-developed in mechanical competence, but lacking in biological intelligence, intuition, awareness; and that it is this, above all, that we need to regain, not only in medicine, but in *all* science."[56] *Awakenings* was certainly a book that put him on the path to rescuing the intuition and awareness that he saw as lost in science. Because it was one of his earlier books, the influence it had on the development of his writing style can be seen in later books, such as *The Man Who Mistook His Wife for a Hat*, in which he retains a narrative voice and expands upon the clinical biographies.

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[53] Ibid., 253.
[54] Ibid., 235.
[55] Ibid., 235–236.
[56] Ibid., 236.

After publishing *Awakenings*, he received a letter from A.R. Luria, praising his writing style and bringing up the neurological narrative, a nineteenth-century tradition.[57] The letter said that the books showed "that the important tradition of clinical case studies [could] be revived and with a great success," and gave Sacks confidence in his works.[58] This might have partly encouraged him to keep writing narrative works; indeed, *The Man Who Mistook His Wife for a Hat* is subtitled *and other clinical tales*. *The Man* was published in England in 1985, and the American edition in 1986.[59] It is a compilation of 24 neurological clinical tales grouped into four parts: "Losses," "Excesses," "Transports," and "The World of the Simple." Sacks describes the book in relation to *Awakenings* by saying "as *Awakenings* was the study of 'an organised chaos' produced by a single if multiform disease, so what now follows is a series of similar studies of the organised chaoses produced by a great variety of diseases."[60] Each essay reads like a narrative case history, with Sacks's insight and sensitivity showing through, and describes various neurological conditions in a way that makes readers more aware of what it might be like to live with one of the disorders.

"The Man Who Mistook His Wife for a Hat," whose title the book takes, is the first chapter of the "Losses" section, and gives the story of Dr. P, a musician and music teacher who suffers a form of visual agnosia that renders him unable to immediately recognize people and objects. At one point during his examination, he is preparing to leave and attempts to lift his wife's head, as he had mistaken it for his hat.[61] At another, he examines a rose and describes it as "a convoluted red form with a linear green attachment" and describes a glove as "a continuous

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[57] Draaisma, "Oliver Sacks (1933-2015)," 188.
[58] Sacks, *On The Move: A Life*, 202.
[59] Ibid., 256.
[60] Sacks, *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, 7.
[61] Ibid., 11.

surface…infolded on itself" that has "five outpouchings."[62] Sacks discusses Dr. P's inability to see objects as familiar and to construct a visual world, but also notes that Dr. P can function in his abstract world by connecting it to music and turning tasks into songs.[63]

In the introduction to "Losses," Sacks notes that "disease is never a mere loss of excess…there is always a reaction, on the part of the affected organism or individual, to restore, to replace, to compensate for and to preserve its identity" and that an essential role of a physician is to "study or influence these means, no less than the primary insult to the nervous system."[64] Throughout his career, Sacks remains true to his words, always studying his patients' reactions and attempting to help his patients preserve their identities. By describing Dr. P's impairment and later how he is able to make sense of his world, Sacks moves beyond a case study on visual agnosia and gives readers a better idea of how his patient had to reason through the most minute details of his day. The chapter, like the rest of the book, is an exercise in artfully conveying the struggles of patients with neurological disorders.

Although they may not have drawn the same degree of attention as *Awakenings* and *The Man Who Mistook His Wife for a Hat*, Sack's other books are equally rooted in his desire to represent the lives, struggles, and emotions of his patients. Each one brings readers nearer to an understanding of the realness of disorder and sickness, whether it be a reference book on headaches such as *Migraine* or a neurological novel on his own experience with injury such as *A Leg to Stand On*. As William Howarth writes in "Oliver Sacks: The Ecology of Writing Science," Sacks's "patients have always represented to him the opportunity to establish a full ecology of healing, a view that emphasizes dynamic exchange, recurring cycles, the balance and

[62] Ibid., 13 and 14.
[63] Ibid., 17.
[64] Ibid., 6.

integrated harmony of health."[65] Undoubtedly, Sacks wrote with the intention of telling the stories of his patients and bringing new understanding to the field of neurology in the process.

Inspiration in the Humanities

It might be helpful to trace the influences that resulted in Sacks writing neurological narratives in lieu of traditional case studies. He was, from the start, under the influence of his physician parents, whom he called "medical storytellers."[66] His mother told stories "to everyone" and gave the same narrative to people regardless of whether they were a colleague or the butcher; his father could recall his patients' "family medical tendencies for generations back."[67] Both of these trends can be seen in Sacks's own works. Like his mother, he developed one form of discourse for multiple audiences; like his father, he cared for his patients for years. For example, when an interviewer for *The Lancet* told Sacks that he enjoyed Sacks's description of "Witty Ticcy Ray," a man with Tourette's syndrome about whom Sacks wrote in *The Man,* Sacks responded that he still saw Witty Ticcy Ray, and that "one of the things that goes with case histories is the length of follow-up, and [he'd had] a lot of patients whom [he'd] known for more than 20 years."[68]

In his memoir, Sacks says that his parents transmitted their "wonder at the vagaries of life, their combination of a clinical and narrative cast of mind" to him and it was through that that he developed an inclination to write, specifically to "chronicle and describe."[69] He recalls fondly how his mother read to him the works of writers such as D.H. Lawrence and Dickens

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[65] "Oliver Sacks: The Ecology of Writing Science," *Modern Language Studies* 20, no. 4 (1990): 119, doi:10.2307/3195064.
[66] qtd. in Weinraub, "OLIVER SACKS HERO OF THE HOPELESS," F1.
[67] Ibid.
[68] qtd. in Boyce, "Oliver Sacks," 1639.
[69] *On The Move: A Life*, 185.

when he was a child.[70] It was at home where he received the literary foundation that would not only encourage him to seek out reading in the future, but that would compel him to write his own pieces as a physician. When studying at the Queen's College, Oxford, Sacks immersed himself in the stacks of the library, where he says he really began to understand his own language and history.[71] While he grew up reading nineteenth-century literature, "it was the catacombs of the Queen's library that introduced [him] to seventeenth- and eighteenth-century literature—Johnson, Hume, Gibbon, and Pope."[72] His writing is riddled with literary references to the great writers of philosophy, history, and religion, and his command of the language at times gives the impression that he was destined to be a poet. A reviewer of *Awakenings* wrote that "such is his intimate knowledge of the literature, that his references include Browne Sir T, Donne J, Eliot TS, Forster EM, Freud S, Goethe J, Kant E, Lawrence DH, Leibniz G, and Nietsche F."[73]

He used these authors not only as references but as inspiration in his own language. Take, for example, his description of Hester Y. in *Awakenings*: "She showed an infinite coercion or *consent* of behaviour—a circular, effortless, ceaseless movement, which seemed still because its locus was infinitesimal in size. She was utterly still, intensely still, yet perpetually moving, in an ontological orbit contracted to zero."[74] In a footnote, he references James Joyce's "An Encounter": "…magnetized by some words of his own speech, his mind was slowly circling round and round in the same orbit."[75] Here, Sacks drew on the observations of Joyce's narrator in the short story, a school-aged boy made uncomfortable by a repetitive and inappropriate old

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[70] Ibid.
[71] Ibid., 17.
[72] Ibid., 16.
[73] Gerald Stern, "Resolving The Conflict Between Art And Science," ed. Oliver Sacks, *British Medical Journal (Clinical Research Edition)* 287, no. 6406 (1983): 1697.
[74] Sacks, *Awakenings*, 79.
[75] qtd. in ibid.

man.[76] Sacks saw parallels between the detached nature of Joyce's character and his own patient, and used them to convey his observations in a clarified way.

A possible reaction against Sacks's writing is that patients cannot be equated to characters. While on one end of the spectrum lie stiff descriptions of the "Hispanic female, unremarkable history, aged 42, presenting with…" sorts, the other might involve the florid, involved characterizations of patients, their personal histories, and possibly their pets that one might read in a Sacks book. In addition to asserting that the details surrounding a patient's life are scientifically and medically necessary for treatment, Sacks gives an explanation for why many of his stories in *The Man* take on the quality of the fantastical:

> Classical fables have archetypal figures—heroes, victims, martyrs, warriors. Neurological patients are all of these—and in the strange tales told here they are also something more. How, in these mythical or metaphorical terms, shall we categorise the 'lost Mariner', or the other strange figures in this book? We may say they are travelers to unimaginable lands—lands of which otherwise we should have no idea or conception. This is why their lives and journeys seem to me to have a quality of the fabulous, why I have used Olser's *Arabian Nights* image as an epigraph, and why I feel compelled to speak of tales and fables as well as cases. The scientific and the romantic in such realms cry out to come together—Luria liked to speak here of 'romantic science'. They come together at the intersection of fact and fable, the intersection which characterises (as it did in my book *Awakenings*) the lives of the patients here narrated.[77]

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[76] James Joyce, *Dubliners* (New York: Penguin, 1993), 18.
[77] Sacks, *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, ix.

Sacks uses "The Lost Mariner" chapter as an example because it references Samuel Taylor Coleridge's *The Rime of the Ancient Mariner,* a poem that tells the story of a sailor's journey at sea.[78] Like the sailor, Sacks's patient the 'lost Mariner' travels to unknown lands, albeit symbolic ones. While a myth or a fable might be a far cry from a very real disorder in a very real person, Sacks does not completely render his stories about his patients abstract. He would be removing them from the reality of their conditions by characterizing them as heroes, victims, or martyrs if he left it as such, but he does not. He also describes them as patients with cerebral palsy, Tourette's, and traumatic brain injuries, delving into the pathological details of their afflictions and the physiological bases of their symptoms. He meanwhile retains an air of mysticism so that it becomes possible to see both natures, that of the mythical character and that of the concrete patient.

Two of Sacks's models in the world of medical writing are Sigmund Freud and A.R. Luria. While Sacks is more vocal about the inspiration he gained from Luria, and of the remote mentorship he obtained from him, many have also pointed out resemblances between Freud's and Sacks's works. Both writers developed theories of the mind, dealt with similar subject manner, and have a tremendous amount of popular appeal. When Sacks discusses metaphysical considerations in his books, it often seems likely that he drew on some of Freud's ideas. Occasionally, Sacks even appears to be asking his patients questions suggestive of a psychoanalytic session.

In a critical paper on Sacks, Ella Kusnetz identifies various points at which Sacks's practice seems "suspiciously" akin to Freud's psychoanalytic techniques.[79] One example is in *Migraine,* where Sacks discusses forms of therapeutic treatment instead of medication, and

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[78] Samuel Taylor Coleridge, *The Rime of the Ancient Mariner* (New York: D. Appleton & Co., 1857).
[79] "The Soul of Oliver Sacks," *The Massachusetts Review* 33, no. 2 (1992): 180.

describes how he would persistently ask his patients about their emotional lives in order to help extract some of their tensions.[80] This, Kusnetz claims, closely resembles Freud's hypno-cathartic method which would end with a "transference-cure," whereby a patient displaces their emotions onto the physician to facilitate their recovery.[81] Another example is how Sacks asks many of his patients to write in journals—a writing cure—which is evocative of a free association talking cure.[82] Ultimately, what Kusnetz sees in Sacks's writing is a therapeutic encounter between him and his patients "informed by increasingly sophisticated understanding of transference and counter-transference."[83]

While Kusnetz is critical of the similarities, largely because Sacks is a neurologist, not a psychoanalyst, it could be argued that Sacks uses transference not as a "transference-cure" but as a means by which to probe his patients for information that might help him when developing a treatment plan or that might offer insight into their conditions, since he believes that his patients' experiences are interwoven with their physiology. Sacks believed that "an adequate characterization of a man…would embrace all that happened to him, all that affected him, and all that he affected," and held that "the most perfect examples of such biography" were Freud's case histories.[84] However, Sacks did not see a comparable precedent set in the world of neurology, as even Luria was a neuropsychologist. He therefore took it upon himself to bring such biographies to the field of neurology, and did so with his books.

Sacks also deeply revered Luria, who had attempted to revive the tradition of the neurological narrative in his later books *The Mind of a Mnemonist* and *The Man with a Shattered*

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[80] Ibid.
[81] Ibid.
[82] Ibid., 183.
[83] Ibid., 176.
[84] *Awakenings*, 192.

World, and regarded him as the founder of romantic science.[85] Fittingly, Sacks took inspiration from him as he wrote his own neurological narratives, and it is evident that the two authors shared similar intentions. Debra Journet, an Associate Professor of English at the University of Louisville, writes that both Sacks and Luria attempted to reconcile the concepts of the brain and the mind, both were disturbed by neurology's tendency to reduce individual patients to neurological examples, and both emphasized the personal experiences of their patients.[86] This was their way of bringing the patient's experience back into scientific discourse, which both felt was missing in neurology. She also argues that both Sacks and Luria blurred the lines between writing in neurology and writing in psychology, creating a synthesis of "the analytical exposition of neurological data with psychological narrative and story."[87] While Sacks's and Luria's works share many similarities, Journet tends to understate the impact Luria had on Sacks's writing, instead grouping the two writers together in her analysis. In reality, reading Luria's writing, especially his lamenting the loss of the tradition of the neurological novel, greatly encouraged Sacks's writing.[88]

Bridging the Gap: A Romantic Science and His Legacy

A.R. Luria dedicated a chapter of his autobiography, *The Making of Mind: A Personal Account of Soviet Psychology*, to romantic science and what it meant to him. Sacks regarded him as the founder of neuropsychology, as Luria was a major neuropsychologist who sought to

[85] Sacks, *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, viii; Sacks, *On The Move: A Life*, 202.
[86] "Forms of Discourse and the Sciences of the Mind: Luria, Sacks, and the Role of Narrative in Neurological Case Histories," *Written Communication* 7, no. 2 (April 1, 1990): 178, doi:10.1177/0741088390007002001.
[87] Ibid., 184.
[88] Sacks, *On The Move: A Life*, 202.

resolve the distinction between nomothetic and ideographic approaches to psychology.[89] "Nomothetic" and "idiographic" are terms used by social scientists to distinguish between different methods of interpreting phenomena, and were named so by philosopher Wilhelm Windelbrand.[90] Windelbrand used the terms to compare the natural sciences, which make scientific generalizations, and are nomothetic or "law-like," to the humanities, which study the particularities of individual cases, and are idiographic.[91] Luria was bothered by the crisis between the two approaches, and often wondered which approach would allow him and other intellectuals to better understand living reality.[92]

According to Luria, psychology lost "the rich and complex picture of human behavior which had existed in the late nineteenth century" when various waves of technical progress led to reductionism, whereby scientists across fields thought reducing complex phenomena to their basic mechanisms would lead to ultimate understanding.[93] In psychology, this translated to the reduction of psychological events to basic physiological mechanisms, and led to a de-emphasis on observation, the loss of which Luria says was especially felt in medicine.[94] He lamented his loss because he believed that proper observation both explains facts, which is its classical aim, and preserves "the manifold richness of the subject," which is its romantic aim.[95] Thus, proper observation is a crucial component of the romantic science of which Luria spoke, and it is clear

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[89] Ibid.; A. R. Luria, *The Making of Mind: A Personal Account of Soviet Psychology* (Cambridge: Harvard University Press, 1979), 175.
[90] W. Edward Craighead and Charles B. Nemeroff, *The Concise Corsini Encyclopedia of Psychology and Behavioral Science*, vol. 3rd ed (Hoboken, N.J.: Wiley, 2004), 458, http://ezproxy.lib.utexas.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=108610&site=ehost-live.
[91] Ibid., 3rd ed:459.
[92] Luria, *The Making of Mind: A Personal Account of Soviet Psychology*, 175.
[93] Ibid., 175–176.
[94] Ibid.
[95] Ibid., 178.

that Sacks, taking cues from Luria, attempted to bring this type of proper observation into his career as a physician.

However, this did not come without difficulty or weakness. Luria wrote that "romantics in science want neither to split living reality into its elementary components nor to represent the wealth of life's concrete events in abstract models that lose the properties of the phenomena themselves."[96] This struggle is apparent when reading Sacks's works and the criticisms of them, which are examined in Part 2 of this thesis. Also apparent in criticisms of Sacks's work is Luria's note that romantic science is not without its flaws; it "typically lacks the logic and does not follow the careful, consecutive, step-by-step reasoning that is characteristic of classical science, nor does it easily reach firm formulations and universally applicable laws."[97] This is a major criticism of writers who take a romantic approach to science, and justly so. But a traditional scientific approach is in no danger of dying out, while the romantic approach depends on scientists, such as Luria and Sacks, to be revived. Sacks's writings often reveal the difficulty he faced in walking a fine line between explaining biological phenomena and elevating his explanations to beyond just that, and the criticisms he faced were abundant when he emphasized one side more than the other.

Alan Wasserstein, a physician at the Hospital of the University of Pennsylvania, wrote an article in 1988 celebrating the empathy and humanity that Sacks brought to his practice and arguing that Sacks's works add value to the possibility of such empathy and humanity being essential to understanding the mechanism of disease.[98] Wasserstein wrote that Sacks chose to romantically reinterpret observations of classical neurology and that he "[did] not choose the

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[96] Ibid., 174.
[97] Ibid., 175.
[98] "Toward a Romantic Science: The Work of Oliver Sacks," *Annals of Internal Medicine* 109, no. 5 (9/1/88 1988): 440.

romantic interpretation over the mechanistic one, but rather [felt] that they are complementary."[99] However, when taken alongside Luria's definition of a romantic science as one in which romantic scientists aspire to "preserve the wealth of living reality," Wasserstein's view that Sacks chose to harmonize romantic science with mechanistic science instead of exclusively focusing on romantic science seems slightly off base precisely because romantic science retains many of the characteristics of mechanistic science.[100] Romantic science itself strives to be a combination of many modalities of thinking: there is an emphasis on the personal encounter, an attempt to draw on various academic disciplines, a desire to humanize disease, and an objective of doing so while remaining rooted in the concrete facts of classical, mechanistic science.

Perhaps Sacks's greatest emphasis in his attempt to revive romantic science is on the individual. In his writing, he elevates the experience of the individual above the place of disease and keeps the experience of the physician relevant as well. In a section of *Awakenings* titled "Perspectives," Sacks expanded upon his view discussed on page 8 of this paper about metaphysical considerations in medicine and science.[101] He wrote that mistakes in medical literature arise when metaphysical considerations are reduced to mechanistic ones.[102] This is because life is inherently individual:

> There is nothing alive which is not individual: our health is *ours*; our reactions are *ours*—no less than our minds or our faces. Our health, diseases, and reactions cannot be understood *in vitro,* in themselves; they can only be understood with reference to *us,* as expressions of our nature, our living, our being-here (*da-sein*)

[99] Ibid., 442.
[100] Luria, *The Making of Mind: A Personal Account of Soviet Psychology*, 174.
[101] *Awakenings*, 191.
[102] Ibid., 181.

> in the world. Yet modern medicine, increasingly, dismisses our existence, either reducing us to identical replicas reacting to fixed "stimuli" in equally fixed ways, or seeing our diseases as purely *alien* and bad, without organic relation to the person who is ill. The therapeutic correlate of such notions, of course, is the ideas that one must *attack* the disease…that one can launch the attack with total impunity, without a thought for the *person* who is ill.[103]

At the heart of Sacks's practice, his works, and his career was his intention of restoring the individual to the center of medicine. Medicine, when Sacks was writing *Awakenings* in the 1960s and 70s, he believed, removed the individual's experience from medical considerations, which made so much of the medical literature of the time "unfruitful, unreadable, inhuman, and unreal."[104] This is understandable, since medicine often tries to find universal laws that govern how the body works, or does not, and the experience of the individual is a subjective variable that should be removed before analysis. In the above excerpt, Sacks negates the possibility of understanding health and disease when examined outside of the context of the individual. Singular aspects of health, disease, and human reactions may be studied and understood *in vitro,* as he says, or under a microscope, and such studies are essential for scientific advancement. Whole systems may be studied in that way as well. But a comprehensive understanding of health and disease cannot be obtained by just these studies. To obtain that comprehensive understanding, scientists must expand their concepts to include the individual and the experiences of the individual.

This view and how he expressed and lived it is what distinguished Sacks from traditional scientists and physicians. His passing in August of 2015 brought a deluge of obituaries from an

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[103] Ibid., 191–192.
[104] Ibid., 191.

entire spectrum of publications, from *Nature* to *The New York Times* to *The Lancet,* all celebrating his legacy. Swaran Singh, a professor at the UK's University of Warwick Medical School, said in Sacks's *The Lancet* obituary that Sacks "will be remembered for turning the therapeutic encounter into the art of understanding human beings in all their complexities" and for making "each clinical history a compelling human story."[105] Singh followed by saying that for Sacks, "the disease was a small part of the richness of the individual," an accurate portrayal, as Sacks often sought to find the place of disease in the overall picture of the individual.[106] His obituary in *The Guardian* offered a similar insight, saying that the importance he placed on individuality in medicine was the "animating theme" of his works.[107] Sacks's emphasis on the experience of the individual, the role of the physician, and humanizing neurological disorders drew readers across disciplines to his writing. He left a rich legacy of elevating neurology above a purely mechanical discipline.

[105] qtd. in Snyder, "Obituary: Oliver Sacks," 1130.
[106] qtd. in ibid.
[107] Adam Zeman, "Oliver Sacks Obituary," *The Guardian*, August 30, 2015, sec. Books, https://www.theguardian.com/books/2015/aug/30/oliver-sacks.

Part 2: Scientific Implications and Contributions

Criticisms: Lack of "Real Science"

Despite the enthusiasm Sacks received from the non-medical community, he often struggled to garner the same level of acclamation from the scientific community. As his writing evolved from the papers he published in neurological journals as a resident to full-length novels of clinical narratives geared toward general readers and professionals alike, the praise he received from scientists and colleagues subsided, and he often found himself struggling to have his clinical papers published in medical journals at all.[108] His non-traditional writing style was mainly to blame for the cold reception, and while he felt "a need to depart from the established," he often was apprehensive about publishing additional pieces that were, in the eyes of the scientific literature community, unorthodox.[109]

Sacks described his first book, *Migraine,* which was published in 1970, as "well within the established medical" writing format.[110] Even so, the book presents as more than just a factual reference book, because in addition to the comprehensive explanation of symptoms of migraines and treatment options, he attempted to relate to his patients and discusses his own experiences as a migraine sufferer. Sacks employs case studies throughout *Migraine,* but they tend to be more sterile than in his later books, not frequently involving the names of patients or emphasis on the more emotional aspects of their condition. One reviewer wrote that "Sacks's writings may be regarded as attempts to define a field," showing that although Sacks may have believed he was somewhat adhering to conventional writing methods, even his early works were considered

[108] Oliver Sacks, "The Origin of 'Awakenings,'" *British Medical Journal (Clinical Research Ed.)* 287, no. 6409 (December 24, 1983): 1968.
[109] Ibid., 1969.
[110] Ibid., 1968.

novel.[111] Neurologist Desmond S. O'Doherty reviewed *Migraine* in *American Scientist* and noted that while Sacks accomplished his stated objective of writing for patients with migraines and general audiences, he wished that Sacks had not included his intention of educating migraine researchers and physicians.[112] He felt that Sacks did not go into the kind of detail regarding the "physiologic, pharmacologic, and therapeutic aspects of migraine" necessary for scientific readers and that "not much new is presented concerning the scientific aspects of migraine."[113] It seems that O'Doherty misunderstood Sacks's objectives in writing *Migraine*. Sacks wrote the book as a type of "detailed, if somewhat discursive, reference book" that could be used to educate general readers on migraines and be a reference point for academics.[114] He even made changes to later editions that included new findings in the field, a way of keeping his reference book relevant to scientists.

The relatively mild reviews of *Migraine* did not prepare Sacks for the criticisms of and lack of enthusiasm for his second book, *Awakenings,* which was published in 1973. As he started writing about his experiences administering L-DOPA to patients, he felt himself departing from the traditional medical writing template and he began writing letters to the editors of peer-reviewed general medical journals such as the *British Medical Journal* and the *Lancet*. Although he felt that the editors enjoyed reading about the phenomena he was witnessing, he felt pressured by the scientific community to write formal scientific journal articles. This pressure often came in the form of vehement negative responses to his letters by his colleagues. One letter he wrote to *The Journal of the American Medical Association (JAMA)* caused such an uproar among his

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[111] Howarth, "Oliver Sacks: The Ecology of Writing Science," 106.
[112] review of *Review of Migraine: Understanding a Common Disorder*, by Oliver Sacks, *American Scientist* 74, no. 1 (1986): 92.
[113] Ibid.
[114] Howarth, "Oliver Sacks: The Ecology of Writing Science," 106.

colleagues that he rewrote his findings in a more conventional format and sent the formal scientific journal articles to medical and neurological journals. To his surprise, he found that they were all still violently rejected or, at best, ignored completely.[115]

Still, Sacks persisted in writing about his patients and published *Awakenings*. He defended his method by saying that he originally intended for *Awakenings* to be a 90-day, double-blind trial of the effects of L-DOPA on patients who survived encephalitis lethargica. However, he abandoned this method of study when he realized that there was no placebo effect in the patients, and that they were reacting to the drug in a completely unprecedented, unexpected way. When explaining how he went about formatting *Awakenings*, he noted:

> Further, as clinical observation extended itself, and gave rise to considerations beyond the strictly clinical—human, scientific, existential, philosophical—it became clearer that [he] would have to break out of a purely medical format, and to find another one that, while remaining faithful to the clinical, could go beyond it and point to something larger and deeper.[116]

When *Awakenings* came out, he once again received a cold reception from his colleagues. There were no medical reviews of the book except for one by the editor of the *British Clinical Journal,* who noted "the strange mutism" of scientific professionals toward *Awakenings*.[117]

Scientific professionals have not been shy to deal out criticism of Sacks general writing style in works other than *Awakenings*. Psychiatrist Arthur Shapiro once said that Sacks "is a much better writer than he is a clinician" and saw his narrative style as having the potential to

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[115] Sacks, "The Origin of 'Awakenings,'" 1968.
[116] Ibid.
[117] Sacks, *On The Move: A Life*, 205.

misinform both the public and scientific community.[118] Other researchers have picked out specific errors in Sacks's writing, commenting on discrepancies that while seemingly trivial could potentially be misleading. For example, in a letter to the *Journal of Autism and Developmental Disorders*, Makoto Yamaguchi challenges the truthfulness of a story in *The Man Who Mistook His Wife for a Hat* about twins with savant syndrome who generate extremely high prime numbers.[119] Yamaguchi points out that Sacks said he was able to play games with the twins in which he would read an eight-digit prime number from a book of prime numbers, and they would respond with the next higher one, but "it is impossible to include such a huge number of numbers in a single book with a reasonable size."[120] When Yamaguchi contacted Sacks to ask about the number, Sacks responded that he had lost the book and admitted that it might have only contained smaller numbers.[121] Although Yamaguchi was not doubting that the twins had an affinity for prime numbers and that Sacks was telling "a basically true story," the possibility of discrepancies between what Sacks wrote and actually witnessed is of great importance to members of the scientific community who hope to learn from Sacks's research.[122]

When reading criticisms such as these, it is easy to understand how members of the scientific community might react with skepticism to Sacks's neurological narratives. After initially reading *Awakenings*, the staunch readers of the usually-staid neurological journals might have felt attacked by Sacks's criticisms of the existing scientific literature about Parkinsonism and post-encephalitic syndromes, which he describes as "couched in the 'objective' styleless

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[118] Andrew Anthony, "Oliver Sacks: The Visionary Who Can't Recognise Faces," *The Guardian*, October 16, 2010, http://www.theguardian.com/theobserver/2010/oct/17/profile-oliver-sacks-author-neurologist.
[119] "Questionable Aspects of Oliver Sacks' (1985) Report," *Journal of Autism Developmental Disorders* 37, no. 7 (2007): 1397, doi:10.1007/s10803-006-0257-0.
[120] Ibid.
[121] Ibid.
[122] Ibid.

style *de rigeur* in neurology" and "the ugliest exemplars of assembly-line medicine."[123] Perhaps the criticisms also arose because his colleagues had not yet seen the reactions of patients to L-DOPA treatment themselves and therefore did not have an appreciation for the narrative style that was required to describe all of the effects, or perhaps they were just comfortable with scientific papers. Even so, Sacks's narrative style can hardly be seen as sensationalism. He remains faithful to clinical language, and although his books lack the figures and statistical analyses so common in journals, he does not abandon neurology as a science in favor of neurology as a writing career. Moreover, his case studies have provided the scientific community with invaluable information on wide ranges of neurological conditions that cannot be readily explained without the use of case studies.

Researchers Roger C. Duvoisin, Joao Lobo-Antunes, and Melvin D. Yahr published an account of postencephalitic Parkinsonism treated with L-Dopa in 1972 in *Journal of Neurology, Neurosurgery, and Psychiatry* titled "Response of patients with postencephalitic Parkinsonism to levodopa." They did so after reading two accounts of the treatment by other researchers and the 'letters to the editor' that Sacks had published (he had not yet published *Awakenings,* which combined and expanded on these 'letters to the editor').[124] Their 30 patients had the same condition as Sacks's, were also being treated in New York at the same time, and also experienced many of the side effects that Sacks's patients had, so comparing the two studies can give an accurate representation of the differences between Sacks's descriptions and the

[123] "The Origin of 'Awakenings,'" 193–194.
[124] Roger C. Duvoisin, Joao Lobo-Antunes, and Melvin D. Yahr, "Response of Patients with Postencephalitic Parkinsonism to Levodopa," *Journal of Neurology, Neurosurgery, and Psychiatry* 35, no. 4 (August 1972): 487.

descriptions of other researchers performing the same functions.[125] Here is an excerpt from Duvoisin et al. about a 70-year-old woman who was treated with L-Dopa:

> …levodopa was started at a daily dosage of 0.75 g and progressively increased. On 5 g daily she began to have mild nocturnal confusion… her signs of Parkinsonism which had showed significant improvement, again became markedly exacerbated. Levodopa was restarted in small doses and with gradual increments a daily total of 2.5 g was attained. A significant functional improvement was achieved, and this increased slightly in the following months. A slight improvement of the severe kyphotic deformity was noticed and she was able to dress herself independently. In September 1969 frequent episodes of palpitations, accompanied by pain in the chest and dyspnoea, occurred. Levodopa was again discontinued.
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> The patient subsequently died of aspiration pneumonia in February 1970…However, one should also note that this elderly woman with severe disabling Parkinsonism of very long duration enjoyed a remarkable improvement which returned her, for nearly a year, to a useful independent existence.[126]

Compare their description to part of Sacks's description of fifty-year-old Margaret A.'s course on L-Dopa:

> By 15 May (the dose had now been raised to 3 Gm. L-DOPA daily), Miss A. showed striking changes in many ways. Her expression had become alert and keen, and her features more mobile; she had ceased to have drowsy periods or sopors in the course of the day. Her posture was maintained upright without

[125] Ibid.
[126] Ibid., 491–492.

> effort. Her rigidity was distinctly reduced. The abnormal mouth-movements had declined in frequency. She described a state of unprecedented energy and well-being.
>
> On 17 May (with raising of the dosage to 4 Gm. L-DOPA daily), there was further reduction in rigidity and akinesia—a variety of daily skills were now within her reach, e.g. dressing and undressing, which had been impossible previously without considerable assistance…Her face was mobile, and she smiled readily. Her eyes were now very wide-open all day, and appeared very "bright." Forced opening and clenching of the jaws again became prominent with the raising of dosage-level.[127]

Both accounts contain typical features of clinical case studies, such as the drug dosage and increments, descriptions of how the dosages are regulated, descriptions of symptoms, and notice of reduction of symptoms. Both reflect on the improvements in quality of life that the patients experienced, and both mention that the patients were able to dress themselves independently following L-Dopa treatment. However, Sacks's passage was a half-page excerpt from a total of six pages describing Margaret A.'s course on L-Dopa, while the Duvoisin et al. excerpt was from a single-column description of one of their cases. This is typical of similar articles in the journal; the rest of the paper consists of their methods, results, and discussion. The Duvoisin et al. paper is an extremely useful resource for those hoping to learn about postencephalitic Parkinsonism's response to L-Dopa. It gives quantitative information about the occurrence of certain symptoms in their patient population as well as histological and

[127] Sacks, *Awakenings*, 125.

biochemical findings from necropsies, such as assays done on subcortical structures that reveal the dopamine concentrations in various locations.[128]

However, Sacks's account provides a closer look at the patient's life during treatment. He includes the patient's own descriptions about her state, which offers a more personal portrayal. Sacks also includes slightly more subjective evaluations, such as the "brightness" of his patient's eyes and the readiness with which she smiled. At the end of the chapter, he describes her after an intense decline in well-being that left her with "almost nothing in-between coma and hypervigilance, Parkinsonism and frenzy."[129] He states that "she is driven this way and that by intense contradictions, impossible decisions between impossible choices" and that "her real interests and activities have practically vanished, and have been replaced by absurd stereotypes, continually ground smaller in the mill of her being."[130] Here he brings in the more personal, mental struggles his patient faces, which the journal article does not do, but which is a useful contribution to the discussion. Still, as mentioned previously, Sacks remains faithful to clinical language in his descriptions and discusses the treatment similarly to other researchers who were studying L-Dopa. While his account does not provide the same amount of physiological explanations and lacks the detailed results from histological analysis that the other article examined has, Sacks's case histories serve as valuable complements to the existing literature and provide a closer understanding of the experience of L-Dopa treatment.

William Howarth wrote that patients "represented to [Sacks] the opportunity to establish a full ecology of healing, a view that emphasizes dynamic exchange, recurring cycles, the

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[128] Duvoisin, Lobo-Antunes, and Yahr, "Response of Patients with Postencephalitic Parkinsonism to Levodopa," 492.
[129] Sacks, *Awakenings*, 131.
[130] Ibid., 131–132.

balance and integrated harmony of health."[131] However, it is when considered alongside other medical works that Sacks's books and their "ecology of healing" can truly be understood in their fullness. They are valuable in themselves because of the unconventional narrative approach that Sacks takes, which does not detract from their clinical significance. And when taken in conjunction with other studies, they allow for scientific literature to fully encompass the subjects at hand.

Limitations and Ethical Considerations of the Case Study as Research

Case studies are greatly valuable for the field of neurology because they allow for exploration of various types of disorders and anomalies that cannot otherwise be replicated or induced for ethical reasons. As seen in Sacks's works, with a case study it is possible to obtain a more in-depth assessment of a patient's behaviors and emotions. Take, for example, his book *Awakenings.* While recording the clinical presentation and the pharmacological details of the L-DOPA treatment, he also recounted the life histories of the patients, as told by them and their families, and their individual reactions to the drug. The case study method allowed him to record the subjective experiences of the patients in addition to the more concrete details of their symptoms. Although not all of Sacks's case studies were done over long periods of time, in *Awakenings*, Sacks provided in-depth longitudinal case studies, which provided him with a systematic method of reporting the effects of L-DOPA over time.

There are various limitations associated with using case studies as a research method. Case studies alone cannot imply causation because they lack control of confounding variables. Since they are done on an individual basis, case studies differ between patients even when done

[131] "Oliver Sacks: The Ecology of Writing Science," 119.

by the same researcher. Additionally, they often do not make use of a scientific method, which makes them more useful for proposing hypotheses than testing them. They also tend to lack generalizability to the wider population since they are based on individual accounts. Case studies are subject to observer biases and the subjectivity of the researcher. It is necessary to bear in mind that when constructing his case histories, Sacks was relaying observational data that came from his own accounts. While this can give readers insight into the workings of Sacks's mind and allow them to understand his patients as he did, it can also present readers with the uncertainty of how accurately the case study portrays the subjects.

For example, in "The Autist Artist" chapter of *The Man,* Sacks describes an autistic patient named José who was "said to be hopelessly retarded" until Sacks discovered his penchant for drawing and encouraged it.[132] One day, when Sacks visited him in the state hospital and asked him to draw a fish that he had drawn during their last visit, José drew the fish and added another companion fish to the drawing.[133] Sacks wrote that he "couldn't avoid the feeling, perhaps a facile one, that this drawing was symbolic—the little fish and the big fish, perhaps him and me?"[134] Here, Sack's personality shows through. While Sacks's subjective interpretation holds value and shows readers how he saw his patient, one might wonder exactly how much symbolism José intended his drawing to have, or why Sacks was so eager to insert himself into the patient's own narrative.

The ethical implications of Sacks's methodology are far-reaching and, at times, unclear. He did not readily answer the question of whether he had obtained consent from his patients; in some of his works he described how he veiled their stories, but in others he gave no indication of

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[132] *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, 214.
[133] Ibid., 223–224.
[134] Ibid., 224.

their wishes regarding their privacy. For example, in all the editions of *Awakenings,* Sacks noted that he faced the difficult problem of presenting his case histories with "detailed information without betraying professional and personal confidence."[135] In an effort to guard his patients' privacy, he used pseudonyms, changed the name and location of the hospital where the treatment took place, and altered other details regarding their lives. However, he did not address the issue of consent in the first edition of the book. It was not until a later, 1984 edition of *Awakenings* that Sacks claimed he had permission from some of his patients to reproduce their information: "the patients themselves…have said to me from the first, 'Tell our story—or it will never be known'."[136] Evidently Sacks felt some kind of motivation to add that information to later editions; it is unclear whether he did so as a response to criticism, to add clarification, or both. However, when comparing the early and late editions of the book, his addition appears to be an afterthought, perhaps not his primary focus.

The nature of how Sacks failed to address privacy and consent in the first edition of *Awakenings* raises the issue of the ethics of writing about his patients in his books, even though privacy and consent were not largely addressed by the medical community during Sacks's earliest years as a physician. Patients often assume that doctors will keep their information confidential, and rightfully so. With the advent of the Health Insurance Portability and Accountability Act of 1996 (HIPAA), medical professionals are federally prohibited from revealing health-related information about their patients that would identify them; HIPAA specifies 18 identifiers such as names, ages, license numbers, and addresses, but aside from prohibiting the inclusion of identifying information, HIPAA does not specifically give guidelines

[135] Sacks, *Awakenings*, xii.
[136] Ibid., 3.

regarding writing about patients in narratives.[137] Although Sacks wrote many of his works before HIPAA was passed in 1996, he was aware of the confidentiality issue and often did change the names and information of patients, sometimes omitting their names altogether. However, since his narratives often describe patients with notable deficits or neurological anomalies, it is conceivable that a patient could be easily identified by someone who knew them, even with changes to their story or name.

When Boston Globe correspondant Dr. Suzanne Koven, who writes about her patients as well, interviewed Sacks and asked if he "felt ambivalent about using patients as 'material,'" he replied that he hoped publishing narratives about his patients did not remove him from his patients' suffering and that he has "always felt [himself] on a sort of moral knife edge" with the issue.[138] He went on to give an example using *Awakenings* that appears to contradict what he said in the later edition about the patients telling him to write about them: "When I wrote *Awakenings*, I thought: My patients are here in New York. I'll just have it published in England, and they'll never know about it."[139] One of the patients he wrote about in the book did find out about the book, and was distraught over how he described her. Sacks responded by writing an elaborate description of her good qualities in later editions of the book, what he saw as "compensation" for what he initially wrote. In the interview, he added that his current practice is to always show his patients what he writes about them before he publishes it so that they may edit it or decide that they no longer want to be included in the publication.

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[137] Anna Reisman, "Should Doctors Write About Patients?," *The Atlantic*, February 18, 2015, http://www.theatlantic.com/health/archive/2015/02/should-doctors-write-about-their-patients/385296/.
[138] Suzanne Koven, "A Conversation with Oliver Sacks about Doctors Who Write," *BostonGlobe.com*, October 28, 2013, https://www.bostonglobe.com/lifestyle/health-wellness/2013/10/27/doctors-writing-about-patients-conversation-with-oliver-sacks-conversation-with-oliver-sacks-about-doctors-who-write/WpVhOHVslkS6hlllFJs5aI/story.html.
[139] Ibid.

Reassuring as it may be that he obtained consent from his patients later in his career, his admission that he wrote *Awakenings* in the hopes that his patients would not read it is unsettling, and the ethics of writing detailed descriptions about them is questionable. However, one reviewer, Alexander Cockburn, goes so far as to virulently accuse Sacks of having the same aim as newspaper tabloids and classifies his works as more polished versions of freak shows. Cockburn started his review by saying "Don't you hate Oliver Sacks?" and ended it with the conclusion that Sacks's writing "is a visit round the bin, looking at the freaks."[140] Cockburn was presumably alluding to Bethlehem Royal Hospital in London, a psychiatric hospital infamous for once allowing the public to pay for entrance to the hospital in order to watch the psychiatric patients for entertainment. The title of Cockburn's review is "Wonders in Barmy Land," an allusion to P.T. Barnum, the American showman and entrepreneur famous for his freak shows that exploited people with physical abnormalities.

But Cockburn erred in equating Sacks to Barnum and his works to glorified freak shows. Throughout his career, Sacks attempted to show his readers what it is like to *be* his patients, not just to see them. His patients were not exhibits on display for public entertainment; he cared about them and worked with them. At the very most, he hoped to improve their conditions or improve how they live with them, and at the very least, he hoped to offer insight into their plight and empathize with them. He helped his patients find how to benefit from their neurological disorders and how to find small victories in their differences. He celebrated their triumphs and saw them as heroes. He suffered alongside them and, by writing about them, humanized them. Sacks might have been at fault for unintentionally catering to people who are drawn to the

[140] "Wonders in Barmy Land," *The Nation*, June 14, 1993, 822.

grotesque and the unnatural, and it is not safe to assume that readers have wholesome intentions, but he was far from a freak show curator.

In a lecture titled "The Cases of Oliver Sacks: The Ethics of Neuroanthropology," Thomas Couser defends the ethics of Sacks's works from the perspective of biomedicine and anthropology.[141] In biomedical ethics, harming, which is considered "aversely affecting someone's interests," is distinct from wronging, which is a violation of rights. Thus, according to Cockburn's freak show analogy, Sacks would be wronging his patients even if they are not physically or mentally capable of objecting to having their stories told because he violates their privacy without benefitting them.[142] Couser responded that Cockburn oversimplifies Sacks's writing practice.[143] Unlike those who set up freak shows to exploit others, Sacks did not write for the purpose of sheer profit and entertainment; he wrote so that his readers could understand the workings of the mind in non-clinical terms. To Couser, the fact that Sacks kept his patients anonymous or changed their names means that "there can be no invasion of privacy or betrayal of confidence."[144] While the assertion that there is no betrayal of confidence or invasion of privacy involved in Sacks's practice is exaggerated, he did take measures to minimize any damage done to his patients, especially as his career progressed. Perhaps the most accurate assessment of the ethics of Sacks's writings comes at the end of Couser's lecture when he suggests that maybe Sacks just "[fell] short of ethical ideals rather than [violated] ethical obligations."[145] It may be argued that Sacks's writing helped bring ideal ethical practices into being, since he and his books have reached a level of general popularity that not many physicians

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[141] G. Thomas Couser, "The Cases of Oliver Sacks: The Ethics of Neuroanthropology," n.d., http://poynter.indiana.edu/files/4213/4513/2230/m-couser.pdf.
[142] Ibid., 2.
[143] Ibid., 3.
[144] Ibid.
[145] Ibid., 11.

reach in their lifetimes. Since they are so popular, they have been the subject of criticisms that may have affected how Sacks treated his practice.

Ella Kusnetz, another cynical critic of Sacks, asked how "his sympathetic engagement with his patients…can help control their diseases."[146] She noted that only one of the patients in *Awakenings* ended up with meaningful work after the L-DOPA treatment and that most of the others reverted to their afflictions following the failure of the treatment. When Sacks reflected on their journeys and "[expressed] their plight in terms of neurosis or metaphysics" she believed that he failed "to respect the nature of their tragedies."[147] What Kusnetz failed to realize was that Sacks did not have the singular aim of controlling disease. The L-DOPA treatment was to control disease; the written narrative was not. Sacks himself noted that his primary intention in *Awakenings* was to give examples and impressions of "what it *feels* like to have Parkinsonism, to receive L-DOPA."[148] There were other scientists researching L-DOPA, but there was not an appropriate language of discourse for the subject. Moreover, there were no other physicians who went through such great lengths to "enter into or share [the patients'] experiences and feelings."[149] Thus, part of the medical value of Sacks's books lies in their ability to bring physicians and researchers closer to their objects of study, and the value of this offsets the potential wrong he did to his patients by potentially violating their privacy. In this way, Sacks's books perform a function of scientific education even as general reading sources.

Furthermore, they inspire confidence in the population. Non-medical and non-academic audiences can be reassured that their doctors, if they are like Sacks, value humanism, awareness, and compassion. In a world of computers, diagnostic tests, and drugs—which hold value on their

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[146] "The Soul of Oliver Sacks," 185.
[147] Ibid.
[148] Sacks, *Awakenings*, 194.
[149] Ibid., 195.

own—it can be comforting to be reminded of the human physicians behind patient care. Sacks's constant celebration of the victories his patients made shifted the focus from their maladies to their hope of transcendence. He recognized that more often than not, his patients did not experience truly happy endings. His metaphysical reflections did not minimize the tragedies of his patients with neurological diseases, but rather they distanced the patients from being thought of as defective. Sacks described the world of people with neurological disorders as "full of unexpected life and resource and courage and humor and just the sheer capacity to survive—and often without bitterness," a much needed description that is often missing from medical discourse.[150]

Value to the Scientific Community

To the Medical Field

If part of the value of Sacks's books is that they bring scientists closer to their objects of study, then another part is that they clarify their objects of study. His colleagues clearly value the narrative approach Sacks took to writing about neurology and defend him against the notion that he did not contribute to the field. Timothy Pedley, Professor of Neurology at Columbia University Medical Center, asserts that by studying various neurological conditions, Sacks "inferred important principles about normal and abnormal brain function," and Antonio Damasio, University Professor at the University of Southern California, states that although Sacks was not a conventional scientist, "the quality of his human observations more than compensated for his clumsiness in a lab."[151]

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[150] Weinraub, "OLIVER SACKS HERO OF THE HOPELESS," F1.
[151] Snyder, "Obituary: Oliver Sacks," 1130.

Sacks himself noted in his memoir, *On the Move,* that he was unskilled as a lab researcher. Even before going to medical school and after working in a lab at Oxford, he "felt that his research as a whole was a failure, and that [he] could never hope to be a research scientist."[152] After medical school, he attempted again in the United States, doing physiology research at the University of California at Los Angeles but writing to his parents that he was "probably too temperamental, too indolent, [and] too clumsy…to make a good research worker."[153] The final blow came later when he was working in New York. After losing a notebook containing months of data from his work with earthworms, he spent months recreating the data, only to later lose the specimen itself. Finally, his supervisors gently told him that he was a "menace in the lab," saying "go and see patients—you'll do less harm."[154]

Still, his lack of luck with earthworms did not translate into ineptitude with research as a whole. Sacks made contributions to the medical community through his more popular books and beyond, including through articles published in medical journals. By writing *Awakenings,* Sacks exposed the medical community to the nuances of treating post-encephalitic patients with the experimental drug L-DOPA. As one of the professors who worked with Sacks at Columbia University Medical Center, Dr. Steven Frucht, said, "Oliver wasn't the only person at the time giving these people L-DOPA. But no one else had the insight and foresight to understand and meticulously document what was happening. The scientific community can learn more about Parkinsonism and the phenomenology of movement disorders from *Awakenings* than any other account written since [William] Gowers," a British nineteenth-century neurologist who wrote

[152] *On The Move: A Life*, 26.
[153] Ibid., 137.
[154] Ibid.

what contemporary neurologists sometimes call "the greatest single-author comprehensive textbook of clinical neurology ever published."[155]

In addition to educating through his own books, he frequently contributed to the already-existing medical literature. In a correspondence piece in the *British Medical Journal*, Sacks offered a critique of an existing natural history of Parkinsonism by Dr. C. A. Pallis.[156] Pallis had written that a record of encephalitis lethargica in 1917 was the first to ascribe symptoms of tremor and rigidity to an infection, but Sacks asserted there was a vivid history of such accounts in the medical literature before 1917, and proceeded to describe the accounts, which date back to 1580.[157] Sacks made a similar response to an article by researchers Chris and Uta Frith that suggested that people with autism and schizophrenia have an inability to relate to the mental states of others that is associated with impairment in medial prefrontal cortex and posterior superior temporal sulcus function.[158] He notes that in clinical practice, there are often patients who "tend to show extraordinary social precocity and acuteness" despite other cognitive impairments, and wondered if those people would have amplified activity in the brain regions discussed.[159] Such responses to medical literature demonstrate that not only was Sacks contributing to medical knowledge, but he was actively engaging with the scientific community as well, monitoring new information and participating in a dialogue with other researchers.

Parkinsonism and Related Disorders has a review titled "Progressive supranuclear palsy and its relation to pacific foci of the parkinsonism-dementia complex and Guadeloupean

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[155] Snyder, "Obituary: Oliver Sacks," 1130; D. J. Lanska, "William Richard Gowers: 1845-1915: Exploring the Victorian Brain," *Neurology* 80, no. 23 (June 4, 2013): 2171, doi:10.1212/WNL.0b013e318295d7d3.
[156] Oliver Sacks, "Parkinsonism: A So-Called New Disease," *The British Medical Journal* 4, no. 5779 (1971): 111–111.
[157] Ibid., 111.
[158] Oliver Sacks, "Social 'Mentalizing' Abilities in Mental Patients | Science," *Science* 287, no. 5451 (January 14, 2000): 233, doi:10.1126/science.287.5451.233e.
[159] Ibid., 233.

parkinsonism," which discusses findings from various researchers, including Sacks, regarding parkinsonism-dementia complexes in different geographic locations.[160] Sacks also published various case studies in journals that lacked the narrative flair of his more popular works. For example, in a 1992 edition of the *British Medical Journal,* he described a patient who, following a trigeminal and oculomotor nerve resection, had a persistent sense of facial deformity even though her face looked completely normal.[161] This added a description of phantom faces to the medical literature and although they are a very common occurrence, they "are hardly ever discussed in textbooks of neurology."[162] Other such non-narrative case studies are present in his list of authored papers.

Sacks devoted a great deal of time to studying lytico-bodig, a neurodegenerative disease that afflicts the indigenous Chamorro population in Guam. The disease resembles parkinsonism in its symptoms, and has features of ALS and Alzheimer's disease as well. In 2002, Sacks and Paul Cox published a paper in *Neurology* titled "Cycad neurotoxin, consumption of flying foxes, and ALS/PDC disease in Guam," suggesting that Chamorros could be ingesting enough of a neurotoxin called beta-methylamino-L-alanine (BMAA) through some of their local food sources to induce lytico-bodig.[163] Their hypothesis prompted numerous studies that investigated the influence of BMAA on neurodegenerative diseases. Although scientists are still unsure about the connection between consumption of BMAA and neurodegenerative diseases, and additional research still needs to be done to determine if there is a cause for concern, Sacks's and Cox's

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[160] John C. Steele et al., "Progressive Supranuclear Palsy and Its Relation to Pacific Foci of the Parkinsonism–dementia Complex and Guadeloupean Parkinsonism," *Parkinsonism & Related Disorders*, 6th International Symposium on the Treatment of Parkinsonism and Related Disorders, 9, no. 1 (October 1, 2002): 39–54, doi:10.1016/S1353-8020(02)00043-3.
[161] Oliver Sacks, "Clinical Curios: Phantom Faces," *BMJ: British Medical Journal* 304, no. 6823 (1992): 364.
[162] Ibid., 364.
[163] Paul Alan Cox and Oliver W. Sacks, "Cycad Neurotoxins, Consumption of Flying Foxes, and ALS-PDC Disease in Guam," *Neurology* 58, no. 6 (March 6, 2002): 956–59.

research provided valuable insight into BMAA biomagnification and the incidence of certain neurodegenerative diseases.[164]

Sacks, in his book *Hallucinations*, presented "a sort of natural history or anthology of hallucinations, describing the experiences and impact of hallucinations on those who have them."[165] He mainly organized the book into chapters about the medical categories into which hallucinations fall, such as blindness, certain syndromes, and narcolepsy. For example, there is a chapter on Charles Bonnet Syndrome, one on hallucinations in Parkinsonism, and one on epilepsy. Within the chapters, he offered personal anecdotes, patient descriptions, histories about the specific types of hallucinations, and explanations about how the brain produces them. In reading *Hallucinations,* one quickly grows to realize that beyond the short tales drawn from his patients' experiences and his own, there a progression that details the history of hallucinations, of sorts, as well as the physiology that explains them.

It seems that a scientific reader would not be bored by what they read in Sacks's *Hallucinations* because there is ample medical knowledge and scientific understanding in addition to the philosophical and narrative details. Sacks gave plenty of information about neuroanatomy and how it relates to hallucinations, explaining, for example, that an abnormal activation of an area in the right inferotemporal cortex might induce a facial hallucination, while certain stimulations of the fusiform gyrus might cause a person to hallucinate letters or words. He also described research done by neuroscientists, such as by Dominic ffytche in London, that hypothesized the neural basis of certain visual hallucinations based on brain imaging studies and that correlated the contents of hallucinations with the particular areas of cortex that are active

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[164] Katie Moisse, "A Batty Hypothesis on the Origins of Neurodegenerative Disease Resurfaces," *Scientific American*, May 28, 2010, http://www.scientificamerican.com/article/batty-hypothesis-on-neurodegeneration-resurfaces/.
[165] Oliver Sacks, *Hallucinations* (New York: Vintage Books, 2013), xiv.

during them.[166] Sacks did, however, manage to give some of his scientific explanations a more artistic edge, as he did in the following striking description of hallucinations in the half-visual field, or hemianopia:

> In contrast to the relatively brief and stereotyped hallucinations of migraine or epilepsy, the hallucinations of hemianopia may continue for days or weeks on end; and, far from being fixed or uniform in format, they tend to be ever changing. Here, one might envisage not a small knot of irritable cells discharging paroxysmally, as in an attack of migraine or epilepsy, but a large area of the brain—whole fields of neurons—in a state of chronic hyperactivity, out of control and misbehaving because of the lessening of forces that normally control or organize them. The mechanism here thus resembles that of Charles Bonnet syndrome.[167]

Here, as in many of his other works, Sacks called on literary devices not typically seen in medical rhetoric to characterize a neural phenomenon. His personification of neurons, in particular, is striking. One could imagine Sacks describing patients in a similar way, as "irritable," "in a state of chronic hyperactivity," or any of the other descriptors he uses. Somehow, the detailed passage does not detract from the analytical task at hand. Sacks still succeeds in presenting an informative characterization of the neural mechanisms at work during hallucinations of hemianopia.

In a review in *Optometry and Vision Science,* visual researcher Vincent Billock discusses *Hallucinations* and the information in it that would be useful for physicians and scientists.[168] In

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[166] Ibid., 23.
[167] Ibid., 165.
[168] Vincent A. Billock, "Hallucinations, Oliver Sacks.:," *Optometry and Vision Science* 90, no. 4 (April 2013): e124–25, doi:10.1097/OPX.0b013e31828f9cc9.

contrast to Sacks's earlier works that focused on elementary hallucinations—understandably, since Sacks was involved in some of the first neural stimulations on basic hallucinations—*Hallucinations* covers more complex types of hallucinations. Billock, who has "been involved in hallucination research for a dozen years," claims to have learned new information with each passing chapter and defends Sacks against the criticism that writing for popular audiences detracts from the academic aspects of his work.[169] He goes on to recommend the book to other visual researchers. Although it is enjoyable, he claims that the book has "a remarkable density and variety of information," which is true and demonstrated by the expanse of information about the neural circuitry, causes of, and treatments for hallucinations.[170]

Migraine expert Dr. Raymond Greene is yet another researcher who recommends Sacks's work. Sacks's first book, *Migraine,* published in 1970, describes both the clinical and non-clinical manifestations of migraine and presents a history of migraine headaches much as *Hallucinations* does later. However, it provides a more technical and detailed view of the disorder, which makes it almost an encyclopedia on the subject. In contrast to the criticisms by O'Doherty that were presented earlier in this paper, Greene says that "the aetiology is completely explored under the headings of genetics, diathesis, periodicity, and situational occurrence. The physiological mechanisms are brilliantly described" and later insists that *Migraine* "is a book that should be read by every physician ever called upon to treat headache."[171] Such a strong endorsement by a leader on the subject should be taken as nothing short of praise and positive regard for the contributions Sacks made to the medical field.

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[169] Ibid., e125.
[170] Ibid.
[171] "Headache," ed. Oliver W. Sacks, *The British Medical Journal* 2, no. 5757 (1971): 345.

Sacks's Books as Tools for Teaching

Sacks's works hold value in the world of academia beyond the scientific community as well. Much of the academic community agrees on the need for a society in which people can be literate in both the sciences and the humanities, as the implications of misunderstanding either can be grave. Some reasons for stressing the importance of teaching the sciences alongside the humanities are "keeping the nation globally competitive, improving the standard of living, and developing a citizen population capable of participating meaningfully in the political process."[172] Whatever their reasons might be, countless professors of both neuroscience and the humanities teach Sacks in their courses as a means by which to engage their students.

In 2015, Hewlet G. McFarlane and Joel Richeimer developed a sequence of neuroscience courses for undergraduate students at Kenyon College.[173] Their primary goal was to provide non-major neuroscience classes that would appeal to students with backgrounds in the humanities and fine arts. They created two classes, *The Neuroscience of Film, Space, and Play,* and *Neuroscience of Emotions, Perspective, and Time*. Both had selections by Oliver Sacks as part of their reading lists, in an effort to "introduce students to the excitement of neuroscience."[174] The researchers believe that "neuroscience is uniquely positioned to engage the arts and humanities…[because] it addresses those issues that artists, writers, poets, and philosophers have wrestled with for centuries."[175]

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[172] Hewlet G. McFarlane and Joel Richeimer, "Using the Humanities to Teach Neuroscience to Non-Majors," *Journal of Undergraduate Neuroscience Education* 13, no. 3 (July 7, 2015): A226.
[173] McFarlane and Richeimer, "Using the Humanities to Teach Neuroscience to Non-Majors."
[174] Ibid., A226.
[175] Ibid.

Sacks's books are especially interesting to students of the humanities and relevant to educators because they provide a compelling narrative while staying grounded in the truth and offering legitimate scientific explanations. The researchers designed the classes using literature that could be read in a liberal arts context instead of primary scientific literature because they thought it would keep students engaged better. A significant number of students enrolled in the courses even though they did not need them to fulfill any class requirements, and the researchers "took [it] as a clear indication that there is a strong interest among [the] students to take science courses taught in a non-traditional way."[176] At the end of the term, the professors judged that they had been successful in creating neuroscience courses that would attract students with primary interest in the humanities and arts.

In the previous example, educators used Oliver Sacks to foster interest in the sciences among students. It has also been the case that professors use Sacks to teach writing skills in composition classes. Notably, Joseph J. Comprone writes an article in the *Journal of Advanced Composition* titled "Reading Oliver Sacks in a Writing-Across-the-Curriculum Course."[177] His aim is to use Sacks's works to figure out how to better teach cross-disciplinary writing, since he sees Sacks as a scientist who struggles to "synthesize two essential discourse allegiances: one to fellow professionals who share rigorous, scientific ways of seeing and interpreting [patients], the other to a universal audience, those committed readers who care that science be rigorous and human but that the writing of the best scientists show how scientific methods might work…"[178]

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[176] Ibid., A232.
[177] Joseph J. Comprone, "Reading Oliver Sacks in a Writing-Across-the-Curriculum Course," *Journal of Advanced Composition* 8, no. 1/2 (1988): 158–66.
[178] Ibid., 159.

Sacks successfully reaches both audiences, and so Comprone wishes to learn from his writing style in order to "make writing-across-the-curriculum classrooms more effective."[179]

Comprone discusses how cross-disciplinary writing is difficult because of the tension between field-specific and field-universal rhetoric, or the need to remain highly specialized while also appealing to a larger, universal audience and wishing to participate in a greater conversation. Sacks addresses the tension by reverting to the "most basic and simple of narrative forms," telling his readers what writing in scientific jargon cannot tell them about the patients' struggles.[180] Using purely clinical terms can often be too technical to truly describe a patient, but Sacks does not stray completely from them and instead chooses a genre, the narrative, that allows him to reach multiple audiences. According to Comprone, Sacks's "marriage of the language, methods, and rhetorical forms of two very different discourse communities brings together under one textual roof" a scientific audience and "the universal audience of generally educated readers who wish to find the human significance" behind science.[181]

Comprone then shifts his focus to pedagogical applications of Sacks's works, attempting to explain how teachers might help their students become writers instead of just consumers of cross-disciplinary works. He proposes having students conduct amateur clinical studies and explore both objective and subjective writing forms so that they can experience the tension firsthand, and then analyze the language Sacks uses to engage two different communities. Students must realize "that Sacks's texts are meant to be renegotiated by interpreters who understand the paradigms behind the scientific and narrative subtexts" in order to become creators of texts such as Sacks's.[182] Here, the focus is not persuading students to become

[179] Ibid., 158.
[180] Ibid., 161.
[181] Ibid., 162.
[182] Ibid., 163.

interested in the sciences, but rather teaching them how to be sensitive to both field-specific and field-universal rhetoric and how to use them in their writing.

The application of using Sacks's works to teach students, both those interested in science and those who are not, is indicative of the overall value his writings hold for general audiences. Like students, general audiences have been captivated by the portal to the medical world that his books offer. This inherent ability to draw readers in is what makes Sacks's works so popular, but the ability to continue engaging audiences in a way that educates readers about the importance of science, and bringing humanity into science, gives his works value beyond that of popular appeal.

Part 3: Examining Sacks's Influence on General Readers

Humanizing the Doctor

Perhaps one of the most foreign subjects to science that Sacks traversed was the concept of doctor-as-patient. Sacks frequently wrote about his own medical conditions and experiences, from his prosopagnosia—an inability to recognize faces—to his history of migraines, to a period in his life filled with incredible amphetamine usage and drug binges. He went as far as to write a book about his experience as a patient following muscle surgery to repair his quadriceps, which he tore while running away from a bull on a Norwegian mountain.[183] These experiences, and moreover, his willingness to share them, removed him from the typical role of physician-scientist because he invited readers to examine him as a patient. This also gave him the ability to relate to his patients on a deeper level, because he understood the implications of being diagnosed and labeled with conditions, and had personal experience with various neurological conditions. Sacks presented himself as a case study, as one of his clinical tales, and took strides to humanize the physician and bring himself into a dialogue with his patients and readers.

As stated in his *Nature* obituary, Sacks grew up at a time when the American Psychiatric Association considered homosexuality to be a mental disorder, an experience that made him sensitive to psychiatric labels and their consequences.[184] His sexuality and his disinclination to believe he had a "condition," or that "[his] identity could be reduced to a name or a diagnosis" was perhaps one of the earliest factors that led to a particular sensitivity to his patients.[185] When Sacks was eighteen, his mother learned about his homosexuality and called him "an abomination," saying "I wish you had never been born!" and refusing to speak to him for days.[186]

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[183] Oliver Sacks, *A Leg to Stand On* (New York: Summit Books, 1984).
[184] Draaisma, "Oliver Sacks (1933-2015)," 188.
[185] Sacks, *On The Move: A Life*, 10.
[186] Ibid., 10–11.

Sacks wrote in his memoir that he maintained the necessity of reminding himself that "[his] mother was born in the 1890s and had an Orthodox upbringing and that in England in the 1950s homosexual behavior was treated not only as a perversion but as a criminal offense."[187] His early experiences no doubt projected themselves onto most of the years of his life, and he wrote that his mother's words "played a major part in inhibiting and injecting with guilt what should have been a free and joyous expression of sexuality."[188] His inhibitions followed him for the next few decades of his life, and he retained the sensitivity that he developed as a young boy.

He would later, in 1981, tell his friend Lawrence Weschler that when doing his residency at UCLA, "[he] was quite suicidal: [he] took every drug, [his] only principle being 'Every dose an overdose.'"[189] Weschler felt that the most important moment in Sacks's professional life was when he realized that his patients at Beth Abraham "were alive on the inside," a realization that "had everything to do with insights Oliver gained from his epic drug bingeing," which in turn derived from "the sexual self-censure that had led him to seek escape drugs in the first place."[190] Sacks had a tendency to self-deprecate, one that he himself recognized as his "fearful-deprecatory part" that would stop him from opening up to friends, saying "No! It's a lie—you're nothing—not real—lie low—shut up—be mute—stay hidden…*Die!*"[191] It seems possible that some subtleties of his uncomplimentary attitude toward himself found their way into his medical practice and writing career. It may have allowed Sacks greater freedom in writing about himself as a patient, as he lived an introspective life, usually critical of himself and reluctant to accept his sexuality. Indeed, he confessed in his memoir that "it [had] sometimes seemed to [him] that [he

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[187] Ibid., 11.
[188] Ibid.
[189] Lawrence Weschler, "A Rare, Personal Look at Oliver Sacks's Early Career," *Vanity Fair*, April 28, 2015, http://www.vanityfair.com/culture/2015/04/oliver-sacks-autobiography-before-cancer.
[190] Ibid.
[191] Ibid.

had] lived at a certain distance from life," a feeling that only fully disappeared when he fell in love with his partner Billy Hayes at the age of 77.[192]

In his 2010 book *The Mind's Eye,* Sacks explores various aspects of human perception, visual and beyond, and describes various conditions ranging from those that render people blind or unable to experience visual perception to those that create hyper-visual experiences.[193] He also includes journal entries from his own battle with an ocular melanoma that produced odd ocular symptoms and left him blind in one eye, the same cancer that metastasized and ultimately led to his passing in 2015. One of Sacks's chapters, "Face-Blind," describes prosopagnosia and opens with an acknowledgment that he has had trouble recognizing faces and places the entirety of his life, and that he has had "a lifetime of trying to compensate."[194] The chapter recounts his experience with prosopagnosia, answers common questions about how people with the condition function, and gives an overview of the neural basis of face blindness, providing results from imaging studies, electrophysiology studies, and autopsies.

Most notably, Sacks expresses how the condition affects everyday life, noting that he "[avoids] conferences, parties, and large gatherings as much as [he] can, knowing that they will lead to anxiety and embarrassing situations."[195] This is part of Sacks's effort to remind readers that while some examples of blunders people with prosopagnosia make might seem comical, they often have devastating implications, such as not being able to recognize a spouse or "pick out their own child in a group of others."[196] This causes readers to imagine what it would be like to experience some of the deficits and to put themselves in the mind of another. Sacks also notes

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[192] Sacks, *On The Move: A Life*, 381.
[193] Oliver Sacks, *The Mind's Eye* (New York: Vintage Books, 2011).
[194] Ibid., 83.
[195] Ibid., 92.
[196] Ibid., 87.

that he believes a significant part of what people call his "shyness," "reclusiveness," "social ineptitude," "eccentricity," and even his "Asperger's syndrome" results from a lack of understanding about his inability to recognize faces.[197] His familiarity with feeling misunderstood likely contributed to his acute observations and his tendency to ask his patients to elaborate on their emotions. By personalizing his book not only with his own reflections as a physician, but with his perspective as a person with a perceptual disorder, Sacks invites readers to share in an experience that is fully and intentionally open to them, outside the constraints of privacy regulations or feelings of infringing on the intimate details of the medical conditions of others. He goes further than what he accomplishes with his clinical tales because does not merely ask readers to attempt to see through the eyes of another by imagining how a patient *might* feel; he encourages a deeper empathy because he *tells* readers how he, a patient, feels.

Sacks's penultimate chapter of *The Mind's Eye*, "Persistence of Vision: A Journal," contains his diary entries from his "Melanoma Journal," beginning in December 2005, when he developed spotted vision and was first diagnosed with an ocular tumor.[198] The journal entries extend to December 2009, and detail his feelings and experiences as he battled cancer. It is in reading Sacks discuss the panic and darkness he felt upon diagnosis, the oddity of one of his former students being his physician, and the way he "[felt] a terrified child, a child screaming for help, inside [him]," that readers are exposed to Sacks's vulnerability and can fully appreciate the honesty with which he related his experiences.[199] His descriptions of his ocular symptoms during treatment and after losing central vision in his right eye are a feat in themselves, for what better way exists for other physicians to understand the plight of their patients—other than

[197] Ibid., 85.
[198] Ibid., 170.
[199] Ibid., 146 and 149.

experiencing it themselves—than to read detailed accounts of symptoms that follow the conventions of neurological writing, such as his descriptions of maintaining "a small crescent of stereopsis" in the lower visual field or losing sixty degrees of central vision.[200] But the most monumental accomplishment Sacks made in *The Mind's Eye*, and other works in which he examined himself as a patient, was leveling the power dynamic between him as a physician and his patients.

Physicians in society possess a tremendous amount of privilege that comes from having access to the bodies of others and the ability to influence decisions regarding health and wellness. They have the knowledge that is thought to have the potential to help cure disease, to remedy illness, and to begin the healing processes. Consequently, patients give their physicians the power to access their lives and bodies, which results in an uneven power dynamic between the two. However, by writing about himself as a case study, Sacks negated the power imbalance that exists between those who treat disease and those who suffer from it. He evened the playing field between doctor and patient, removing himself from any imagined pedestal upon which many physicians stand and opening a dialogue between himself and other patients. His works might have served as an encouragement to other patients to explore and write about their experiences as well. In the last lines of Sacks's obituary in *The Guardian,* Zeman captured the essence of what he called a final, potentially most-revealing criticism of Sacks:

> [Sacks] crossed the line that normally separates doctors from their patients, and he did so twice over. But the truth, as Sacks knew well, is that this dividing line, important as it is, can be made an excuse for professional arrogance. Doctors need

[200] Ibid., 193 and 197.

> to bring something of themselves to their patients, to make a personal connection, if medicine is to be a healing science.[201]

Bringing something of himself to his patients, although criticized, was one of Sacks's most notable accomplishments, one that may have changed how many people viewed the medical community and even their own physicians. By bringing himself into the dialogue as a patient, Sacks made it evident that all people are afflicted in some sense by a disorder, condition, or sickness.

Sacks's ability to relate his experiences to those of his patients, combined with his ability to provide empathetic narratives about neurological conditions, serves a function of inspiring confidence in the general population. Readers can be reassured that in the midst of batteries of tests, computed studies, and technological advancements, there exist competent physicians who also value humanism and empathy at a deeper level. His publications drew responses from his audience, and he was often in correspondence with general readers who would compare their experiences to those of his patients.[202] For example, after publishing the individual case study about Dr. P, "The Man Who Mistook His Wife for a Hat," he received many letters from people with similar perceptual problems, and he realized that his own prosopagnosia was not as uncommon as he had believed it to be.[203] The same can be said for the readers reading his works, who likely feel a sense of solidarity upon realizing there are other people facing similar plights. When reading Sacks's works, his audience sees both Sacks as a doctor and Sacks as a patient, his own patient. However, the distinction between the two roles is hard to draw because Sacks brought what he learned as a patient to his practice as a physician, and treated his patients with

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[201] Zeman, "Oliver Sacks Obituary."
[202] Sacks, *The Mind's Eye*, 88.
[203] Ibid., 90.

the same humanity that he recognized he needed. In many ways, this is the pinnacle of an empathetic practice, one of the many goals he reached through his writing.

Conclusion

Oliver Sacks had a unique and groundbreaking way of reconciling the sciences and the humanities through his work and writings. The way in which he wrote about his patients has implications for general readers, the scientific community, and the literary community, especially in light of the argument that it has become increasingly difficult to bridge the gap in knowledge between intellectuals in the sciences and intellectuals in the humanities. Beyond the immediate literary and natural science communities, his works have applications in the social sciences, in the world of education, and fields across disciplines. His contributions to both the literary and scientific communities were extraordinarily significant, even though he faced criticism for departing from the de rigueur scientific writing form.

By writing in the form of clinical tales, Sacks was able to characterize disease as a part of his patients in a more empathetic way. He helped revive the tradition of the neurological narrative with the aim of restoring the patient to the center of the case study, and elevated the experience of the individual in medicine. His descriptions humanized disease and the realities his patients faced, bringing his patients out of the shadows and stigma of disorder and reminding readers that they, too, have much in common with his patients. This inspires an awareness and compassion for people who are afflicted, and encourages greater empathy in the population. Sacks's methodology does not serve to replace traditional, mechanistic science, but to enhance it. Furthermore, by examining himself as a patient, he not only humanized himself as a physician, but reminded readers that other physicians might be relatable as well. Many of his personal experiences found their way into his practice, and he treated his patients with the compassion and understanding that was often lacking from others' treatment of him. In many ways, Sacks

himself experienced the transcendence that he so often spoke of in the experiences of his patients.

His obituary in *The Guardian* included the following quote:

> …Sacks was such a resonant writer precisely because his sense of the importance of the personal and human, learned partly from his humane medical parents, is tempered by an equal attraction toward the abstract and scientific. His writing inhabits the tension, constantly present in medicine, between art and science, the warmth of individual lives and the cooler strength of general principles. [204]

The tension Sacks's writing inhabited needs to be permeated by more scientific and medical writers. Many academics have made it evident that science and medicine need to be brought into dialogue with the humanities, but few writers have done more to resolve the conflict than Oliver Sacks. Perhaps the greatest contribution he made was bringing his own experiences into his practice, because he likely would not have displayed the same level of empathy without recognizing that what was missing from his own treatment as a patient was a higher dose of humanity.

[204] Zeman, "Oliver Sacks Obituary."

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Biography

Mary Elizabeth Guerra was born in McAllen, Texas on October 8, 1993. She moved to Austin in 2012 and enrolled at The University of Texas at Austin, where she earned degrees in Neuroscience and the Plan II Honors Program. During her time at The University of Texas, she was an undergraduate research assistant in the Mauk Lab for four years, and also assisted Dr. Marc Lewis with molecular biology research. She was a member of Kappa Kappa Gamma fraternity, and graduated in December 2016. Mary Elizabeth will be attending medical school in 2017.